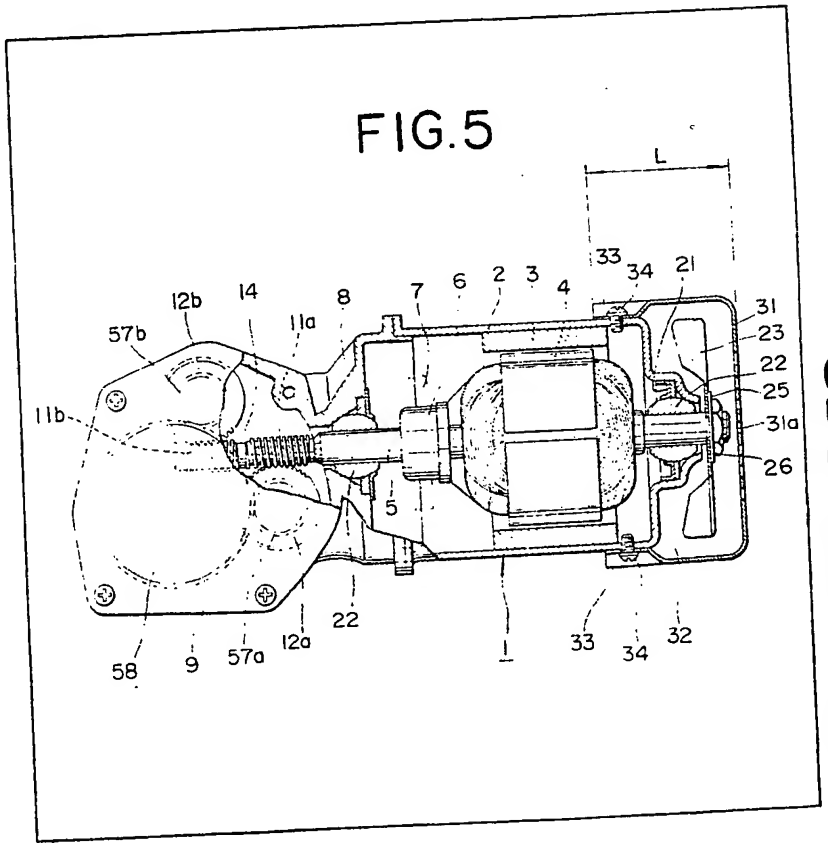
(12) UK Patent Application (19) GB (11) 2 086 145 A

(21) Application No 8125333
(22) Date of filing 19 Aug 1981
(30) Priority data
(31) 55/121824U
55/121825U
(32) 29 Aug 1980
(33) Japan (JP)
(43) Application published
6 May 1982
(51) INT CL³
H02K 9/00 7/06
7/116 // F16H 1/16 H02K
7/08
(52) Domestic classification
H2A KS VD WW
F2Q 7A3E
(56) Documents cited
GB 1125069
GB 766951
GB 666693
GB 592904
GB 280635
(58) Field of search
H2A
(71) Applicants
Jidosha Denki Kogyo,
Kabushiki Kaisha,
No. 1760 Higashimatano-
cho, Totsuka-ku,
Yokohama-City,
Kanagawa-Pref, Japan
(72) Inventor
Koki Hirano
(74) Agents
Page White & Farrer,
27 Chancery Lane,
London WC2A 1NT

(54) An air cooled wiper motor

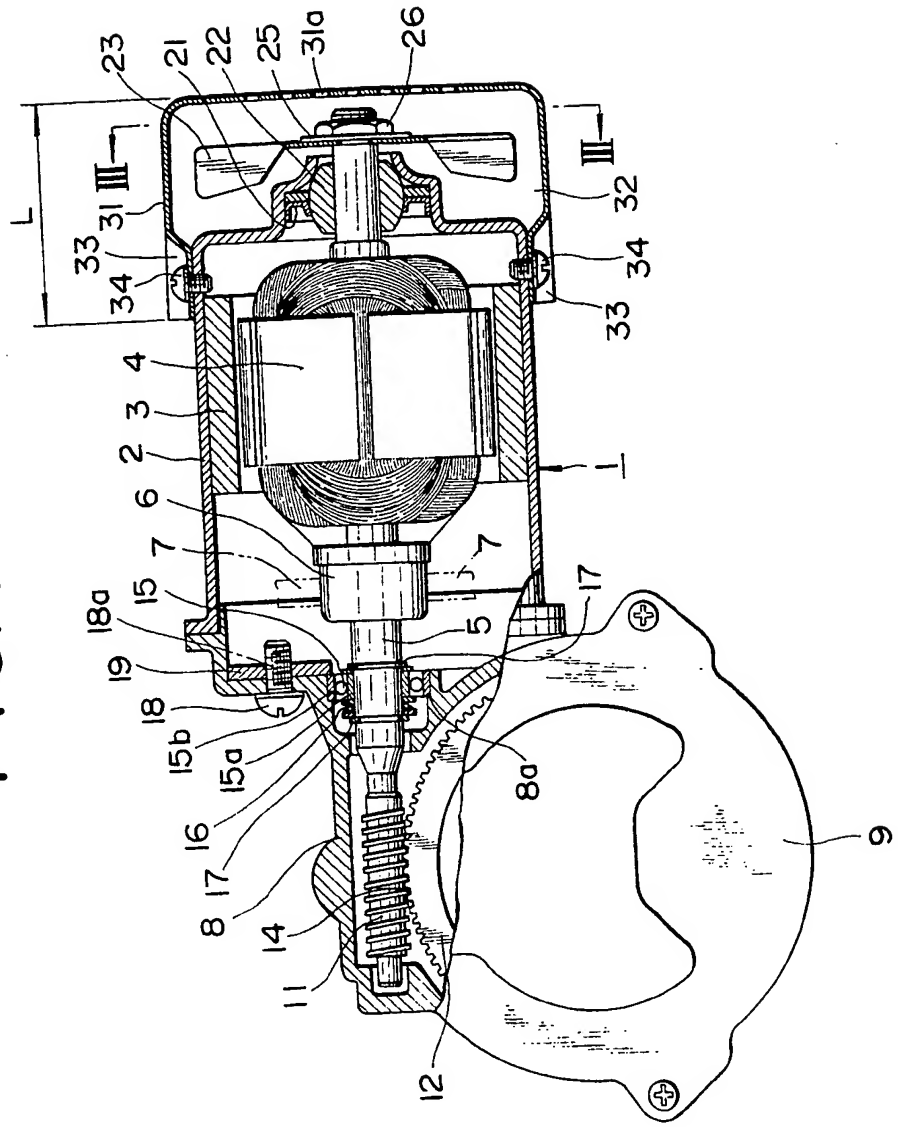
(57) An air-cooled wiper motor having self-cooling fan comprises a motor yoke 2, a rotatable armature shaft, reduction gear mechanism 14, a vehicle wiper blade connected to the armature shaft through the gear mechanism 14 and swung reciprocally, a self-cooling fan 23 at the other end of the armature shaft, and a fan cover 31 forming a ventilation duct 32 having a width not exceeding an outer diamerer of the yoke in one diametrical direction for fitting in a narrow space (Fig. 3, not shown). The opposed threads of worm gears 11a, 11b cancel thrust loads. Thrust holding bearing arrangements are described w.r.t. Figs. 1 and 4 (not shown).

FIG.5



GB 2 086 145 A

FIG. 1



2086145

FIG.2

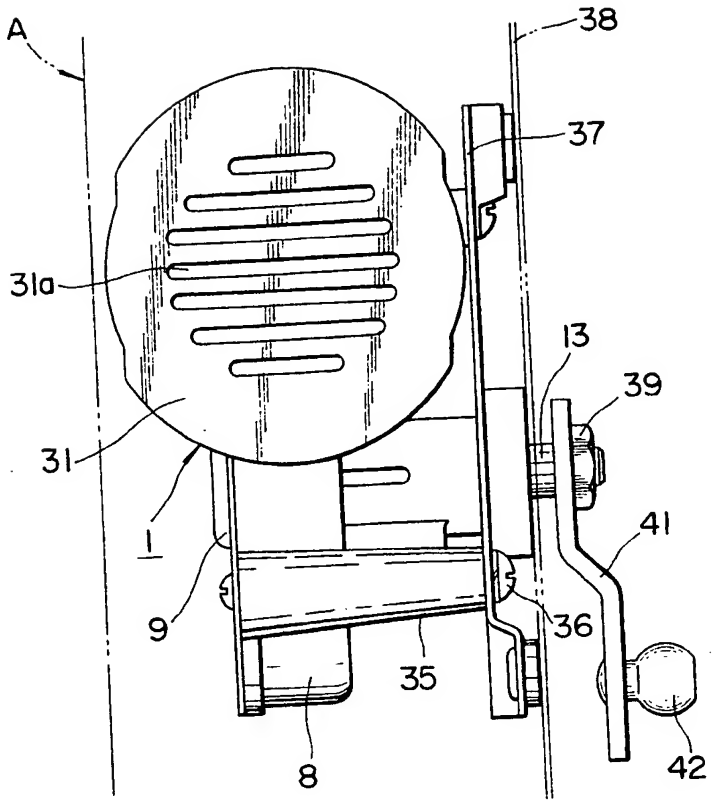
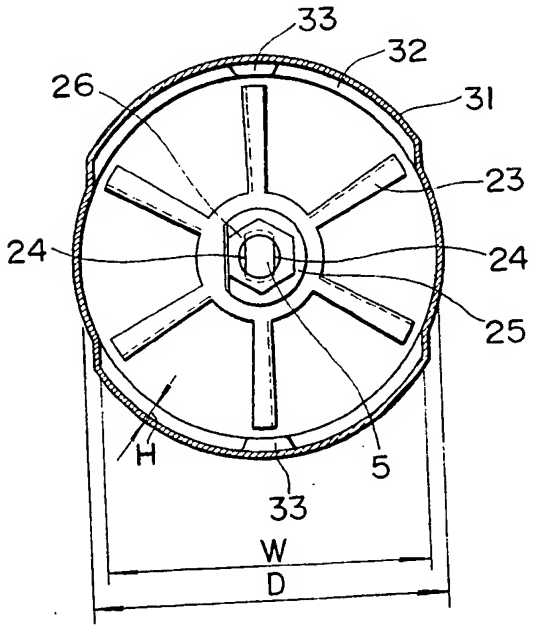


FIG.3



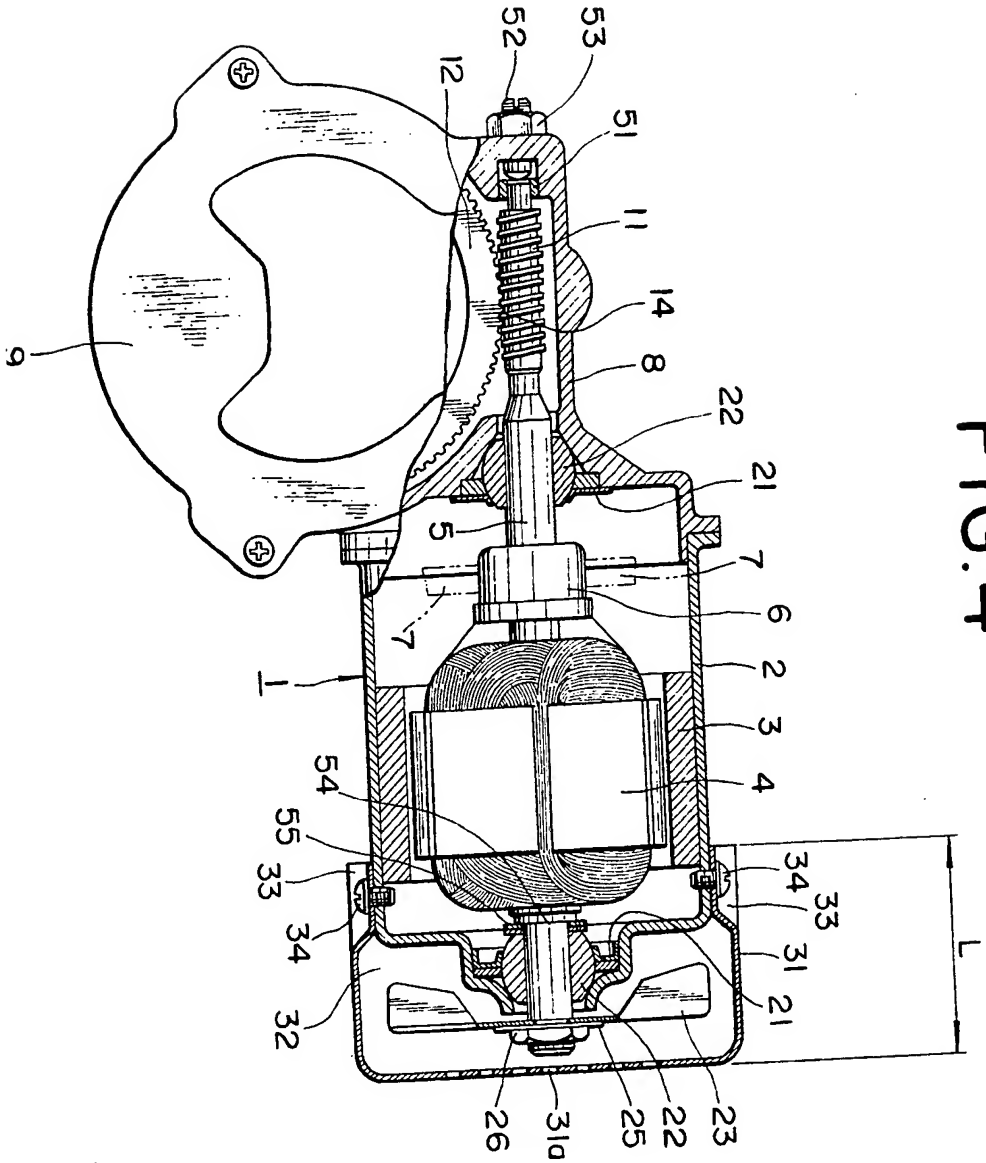


FIG.4

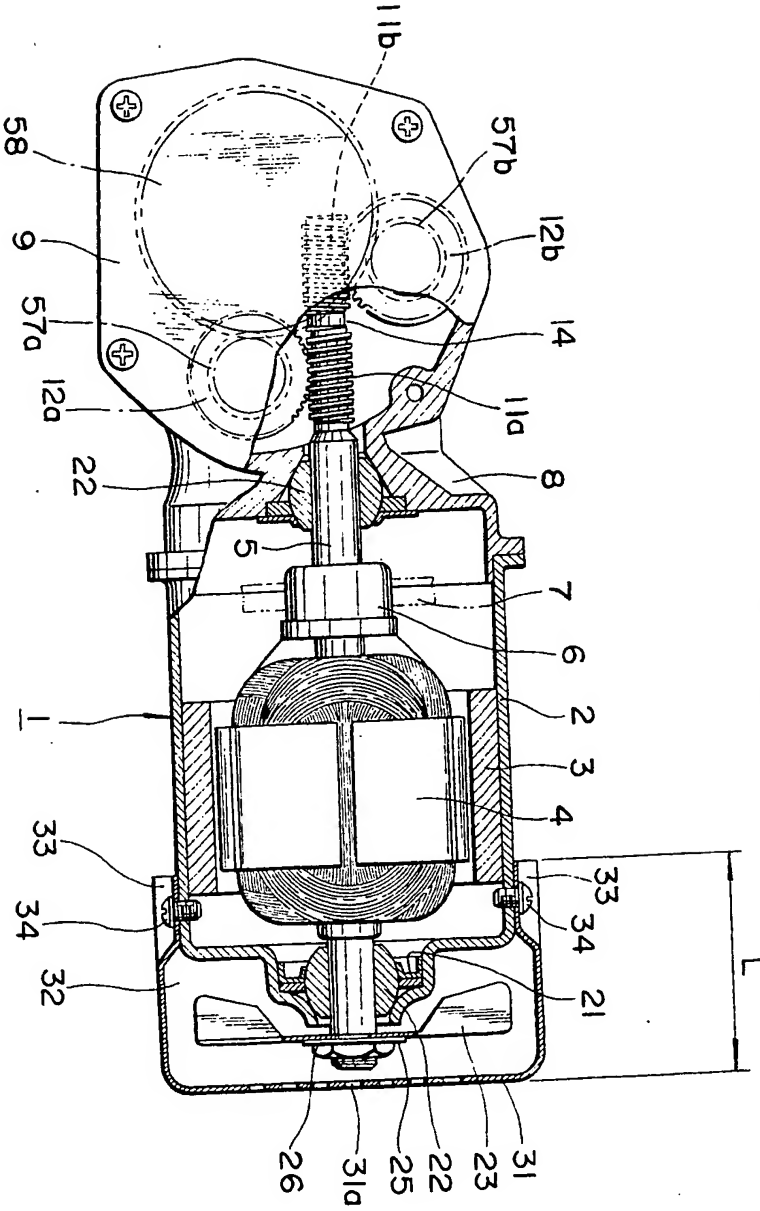

11b
58
57b
9
12b
14
57a
12a
11a
22
8
5
7
6
2
1
3
4
33
34
32
33
34
21
L
26
31a
25
22
23
31

FIG.5

SPECIFICATION

An air cooled wiper motor

The present invention relates to a wiper motor for vehicles, more particularly to an air-cooled wiper motor provided with a self-cooling fan.

Recently, parts for vehicles, particularly for automobiles are tried to be light in weight viewed from economy of fuel, material or the like, while a wiper blade tends to be large for the purpose of obtaining the good field of vision during driving. Therefore, the power output of a wiper motor is getting larger, and the wiper motor becomes inevitably large, but such phenomenon is against a tendency of light weight.

On the other hand, as means for making the motor light or increasing only the power output with the same motor, it has been known to cool the motor with a fan. In this case, the fan is roughly divided into the following types, that is, an open type (which passes a cooling air into the motor) and a totally-enclosed type (which passes a cooling air to the outside of the sealed motor), according to use. Among these types, in case of the totally-enclosed type, in general, a ventilation cover is concentrically provided around the outer periphery of a motor to form an annular ventilation duct between the ventilation cover and the outer periphery of the motor, so that an outer diameter of the motor inclusive of the ventilation cover becomes large as a whole. In recent automobiles, piping for a brake master, cable for an automatic speed control device or the like is arranged close to a wiper motor (refer to symbol A in Fig. 2), so that it is necessary to secure the wiper motor in a fairly narrow space, and thus it is difficult to make an outer diameter of the wiper motor large in order to form a ventilation duct for cooling the wiper motor.

While an increase of the power output of the wiper motor is tried by securing a self-cooling fan to the armature shaft of the wiper motor without enlarging the wiper motor itself.

On the other hand, in the conventional wiper motor, a deceleration gear mechanism portion of a worm is provided at one end of the armature shaft, a wiper blade is reciprocally swung, and a thrust load received by the armature shaft by the deceleration gear mechanism portion is supported on the other end of the armature shaft. However, because of an increased power output of the wiper motor, when securing the self-cooling fan on the other end of the armature shaft, the construction for supporting the thrust load becomes complicated in the conventional case and assembling workability becomes lowered.

An object of the present invention is to eliminate the above described disadvantages of the conventional wiper motor.

Another object of the present invention is to provide an air-cooled wiper motor which can be secured to a narrow portion of the vehicle and can increase the power output in the same motor.

A further object of the present invention is to provide an air-cooled wiper motor, which can increase the power output without enlarging the wiper motor itself, and can well support thrust load received by an armature shaft in both directions.

According to the present invention there is provided an air-cooled wiper motor comprising a motor yoke, an armature body of a revolving type provided therein, a rotatable armature shaft secured to the armature body, a reduction gear mechanism provided at one end of the armature shaft and connected to a vehicle wiper blade, a self-cooling fan provided to the other projected end of the armature shaft, and a fan cover provided around the fan for forming a ventilation duct having a width exceeding an outer diameter of the yoke in one diametrical direction between the cover and the outer diameter portion of the yoke. The wiper motor further comprises a bearing an inner race secured to the armature shaft and an outer race secured to a gear housing of the reduction gear mechanism thereby to hold thrust loads in both directions received by the armature shaft. The fan cover has at least one portion contacted to the yoke for reinforcing the fan cover in the ventilation duct. The reduction gear mechanism comprises a worm integrally provided to the one end of the armature shaft, and a worm wheel secured to a reduction shaft and being meshed with the worm. The reduction gear mechanism comprises two worms integrally provided to the one end of the armature shaft, the gear threading directions thereof being opposite to each other on the same axis, and two worm wheels provided at both sides of the worm axis and being meshed with the worms thereby to rotate a wiper drive gear in the same direction. The worm comprises a bearing secured to the gear housing and a thrust screw for controlling a thrust gap of the armature shaft.

Some embodiments of the invention will now be described by way of example and with reference to the accompanying drawings in which:—

Fig. 1 is an elevational view in section showing one embodiment of an air-cooled wiper motor according to the present invention;

Fig. 2 is a right side view of the wiper motor shown in Fig. 1;

Fig. 3 is a cross-sectional view taken along the line III—III of Fig. 1;

Fig. 4 is an elevational view in section showing another embodiment of an air-cooled wiper motor according to the present invention; and

Fig. 5 is an elevational view in section showing a further embodiment of an air-cooled wiper motor according to the present invention.

Referring now to the drawing, wherein same reference characters designate same or corresponding parts throughout the several views, Figs. 1 to 3 show an embodiment of an air-cooled wiper motor according to the present invention. As shown in Fig. 1, a wiper motor 1 comprises a field magnet 3 fixed to the inner wall of a motor yoke 2, an armature 4 and an armature shaft 5 being rotatable in the field magnet 3, a

commutator 6 secured to the armature shaft 5, and carbon brushes 7 contacted to the commutator 6. The carbon brushes 7 are secured to the portion where the yoke 2 is engaged with a gear housing 8. Reference numeral 9 is a cover of the gear housing 8.

One end of the armature shaft 5 is integrally provided with a worm 11, and a worm wheel 12 meshed with the worm 11 is fixed to a reduction shaft 13 (refer to Fig. 2) to freely rotate it in the gear housing 8, thereby to form a reduction gear mechanism portion 14. The reduction gear mechanism portion 14 is not limited to the above construction but may use spur gear, helical gear, bevel gear and other members.

An inner race 15a of a ball bearing 15 is inserted between the commutator 6 of the armature shaft 5 and the worm 11, and the inner race 15a is fixed to opposite snap ring 17 through a corrugated sheet washer 16 sandwiched by two plain washers, while an outer race 15b of the ball bearing 15 is pressed and inserted into a step portion 8a formed in the gear housing 8. A keep plate 19 fitted on a deformed portion 18a of a set-screw 18 is moved to a side wall of the outer race 15b by rotating the set-screw 18 so as to prevent the ball bearing 15 from slipping off.

The other end of the armature shaft 15 is extended through an oil retaining bearing 22 held by a bearing holder member 21 and projected from the yoke 2 to fix a self-cooling fan 23 to this end portion. In this case, a flat portion 24 is provided in the armature shaft 5, a washer 25 having a hole fittable to the flat portion 24 is fitted on the flat portion 24, and then a nut 26 is fastened to the flat portion 24, and a part of the washer 25 is, thereafter, bent to the side surface of the nut 26 to form a locking.

A fan cover 31 having a number of air suction holes 31a is provided around the self-cooling fan 23 to form a ventilation duct 32 between the outer diameter portion of the yoke 2 and the fan cover 31. The shape of the fan cover 31, as shown in Fig. 3, is so formed that the ventilation duct 32 has a width W not exceeding an outer diameter D of the yoke 2 and an air amount necessary for cooling can be positively obtained by a height H of the ventilation duct 32. Moreover, a length L of the fan cover 31 is so determined as to obtain the strength necessary enough to send air along the outer periphery of the yoke 2 thereby to prevent the weight from increasing. Furthermore, in the ventilation duct 32 of the fan cover 31 there is provided at least one portion 33 contacted closely to the yoke 2 which is used for reinforcing the fan cover 31 and fixing it by a screw 34.

The wiper motor 1 according to the above construction is secured to an inner wall 38 of a vehicle body through a fitting leg 35 of the gear housing 8, a screw 36, and a bracket 37 or the like, while rotation of an arm 41 fixed to the reduction shaft 13 with the use of a nut 39 is changed to reciprocal swing of a wiper blade (not shown) through a ball joint 42.

Thus, according to the above embodiment, the width W of the ventilation duct 32 does not exceed the outer diameter D of the yoke 2, the air amount necessary for cooling is positively obtained by the height H of the ventilation flue 32, and the length L of the fan cover 31 is limited to the least necessary, so that the power output of the wiper motor 1 can be increased without increasing size and weight thereof, it can be secured to a narrow portion in the same manner as in the conventional one, and thrust loads in both directions received by the armature shaft 5 can sufficiently be supported by the ball bearing 15, so that any troublesome work such as thrust adjusting or the like can be eliminated.

Fig. 4 shows another embodiment of the air-cooled wiper motor according to the present invention. In this embodiment, the end portion of the armature shaft 5 placed at the side of the gear housing 8 is also supported by the oil retaining bearing 22, which is held by the bearing holder member 21. Moreover, one end portion of the worm 11 from bending, and then a thrust gap of supported by a bearing 51 so as to prevent the worm 11 from bonding, and then a thrust gap of the armature shaft 5 is adjusted by a thrust screw 51. The thrust screw 52 is fixed by a nut 53. The other end portion of the armature shaft 5 is provided with a step portion 54, and a washer 55 is inserted between the oil retaining bearing 22 and the step portion 54.

Thus, according to the embodiment shown in Fig. 4, in addition to an effect based on the fan cover 31 in the above embodiment, since the worm 11 is prevented from bending by the bearing 51, irrespective to increase or decrease of a load, the worm 11 and the worm wheel 12 are constantly meshed with each other, so that the efficient reduction gear mechanism portion 14 can be obtained.

Fig. 5 shows a further embodiment of the air-cooled wiper motor according to the present invention. In this embodiment, two worms 11a and 11b are integrally provided to one end of the armature shaft 5. In this case, gear threading directions of the worms 11a and 11b are opposite to each other on the same axis. Moreover, two worm wheels 12a and 12b meshed with the worms 11a and 11b, respectively, are integrally provided with pinions 57a and 57b, respectively, the mesh with the gear 58 thereby to rotate it in the same direction. The gear 58 is fixed to the reduction shaft 13, and the oil retaining bearing 22 is used at the end portion of the armature shaft 5 placed at the side of the gear housing 8. The other construction thereof is the same as in the case shown in Fig. 1.

According to the embodiment shown in Fig. 5, therefore, in addition to an effect based on the fan cover 31 in the above embodiment, since the gear threading directions of the worms 11a and 11b are opposite to each other, the thrust loads received by the armature shaft 5 are cancelled with each other, so that any troublesome thrust adjusting work or the like becomes unnecessary.

As described above, according to the present

invention, the width W of the ventilation duct formed between the fan cover and the outer diameter of the yoke does not exceed the outer diameter D of the yoke, and an air amount necessary for cooling is positively obtained by the height H of the ventilation duct, so that the power output of the wiper motor can be increased largely without increasing size and weight thereof and the wiper motor can easily be secured to a narrow portion of the vehicle in the same manner as in the conventional one. Moreover, the thrust load received by the armature shaft in both directions can be held by the bearing, so that it is not necessary to employ any complicated construction for holding the thrust load received by the armature shaft as before.

CLAIMS

1. An air-cooled wiper motor comprising a motor yoke, an armature body of a revolving type provided therein, a rotatable armature shaft secured to the armature body, a reduction gear mechanism provided at one end of the armature shaft and connected to a vehicle wiper blade, a self-cooling fan provided to the other projected end of the armature shaft, and a fan cover provided around the fan for forming a ventilation duct having a width not exceeding an outer diameter of the yoke in one diametrical direction between the cover and the other diameter portion of the yoke.

2. An air-cooled wiper motor as claimed in claim 1, further comprising a bearing having an inner race secured to the armature shaft and an outer race secured to a gear housing of the reduction gear mechanism thereby to hold thrust loads in both directions received by the armature shaft.

3. An air-cooled wiper motor as claimed in claim 1, wherein the fan cover has at least one portion contacted to the yoke for reinforcing the fan cover in the ventilation duct.

4. An air-cooled wiper motor as claimed in claim 1, wherein the reduction gear mechanism comprises a worm integrally provided to the one end of the armature shaft, and a worm wheel secured to a reduction shaft and being meshed with the worm.

5. An air-cooled wiper motor as claimed in claim 1, wherein the reduction gear mechanism comprises two worms integrally provided to the one end of the armature shaft, the gear threading directions thereof being opposite to each other on the same axis, and two worm wheels provided at both sides of the worm axis and being meshed with the worms thereby to rotate a wiper drive gear in the same direction.

6. An air-cooled wiper motor as claimed in claim 4, wherein the worm comprises a bearing secured to the gear housing and a thrust screw for controlling a thrust gap of the armature shaft.

7. An air-cooled wiper motor substantially as hereinbefore described with reference to Figures 1 to 3 or Figure 4 or Figure 5 of the accompanying drawings.

Printed for Her Majesty's Stationery Office by the Courier Press, Leamington Spa, 1982. Published by the Patent Office, 25 Southampton Buildings, London, WC2A 1AY, from which copies may be obtained.

INTERNATIONAL SEARCH REPORT

Inter Application No
PCT/EP 01/06398

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 F16H57/02 F16C25/04

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 F16H H02K F16C F16F F16B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 2 703 737 A (TURNER EUGENE L) 8 March 1955 (1955-03-08) the whole document	1
A	GB 2 086 145 A (JIDOSHA DENKI KOGYO KK) 6 May 1982 (1982-05-06) page 2, line 16 - line 27; figure 1	1
A	DE 196 52 929 A (TEVES GMBH ALFRED) 25 June 1998 (1998-06-25) abstract; claims 1,5,9; figures	1
A	DE 198 22 478 A (NSK LTD) 3 December 1998 (1998-12-03) column 5, line 60 -column 6, line 24; figure 2	1

☐ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
23 October 2001	30/10/2001

Name and mailing address of the ISA	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+31-70) 340-3016	Mende, H

Form PCT/ISA/210 (second sheet) (July 1992)

INTE, ,TIONAL SEARCH REPORT

...er nal Application No

...rmation on patent family members

PCT/EP 01/06398

Patent document cited in search report	Publication date	Patent family member(s)		Publication date
US 2703737 A	08-03-1955	NONE		
GB 2086145 A	06-05-1982	DE	3132787 A1	13-05-1982
		FR	2489226 A1	05-03-1982
		US	4399380 A	16-08-1983
DE 19652929 A	25-06-1998	DE	19652929 A1	25-06-1998
		DE	59704401 D1	27-09-2001
		WO	9826963 A2	25-06-1998
		EP	0944506 A1	29-09-1999
DE 19822478 A	03-12-1998	JP	11043062 A	16-02-1999
		JP	11171027 A	29-06-1999
		DE	19822478 A1	03-12-1998
		GB	2327652 A ,B	03-02-1999
		US	6044723 A	04-04-2000

INTERNATIONALER RECHERCHENBERICHT

Internales Aktenzeichen
PCT/EP 01/06398

A. KLASSIFIZIERUNG DES ANMELDUNGSGEGENSTANDES
IPK 7 F16H57/02 F16C25/04

Nach der Internationalen Patentklassifikation (IPK) oder nach der nationalen Klassifikation und der IPK

B. RECHERCHIERTE GEBIETE

Recherchierter Mindestprüfstoff (Klassifikationssystem und Klassifikationssymbole)
IPK 7 F16H H02K F16C F16F F16B

Recherchierte aber nicht zum Mindestprüfstoff gehörende Veröffentlichungen, soweit diese unter die recherchierten Gebiete fallen

Während der internationalen Recherche konsultierte elektronische Datenbank (Name der Datenbank und evtl. verwendete Suchbegriffe)
EPO-Internal, PAJ

C. ALS WESENTLICH ANGESEHENE UNTERLAGEN

Kategorie*	Bezeichnung der Veröffentlichung, soweit erforderlich unter Angabe der in Betracht kommenden Teile	Betr. Anspruch Nr.
A	US 2 703 737 A (TURNER EUGENE L) 8. März 1955 (1955-03-08) das ganze Dokument	1
A	GB 2 086 145 A (JIDOSHA DENKI KOGYO KK) 6. Mai 1982 (1982-05-06) Seite 2, Zeile 16 - Zeile 27; Abbildung 1	1
A	DE 196 52 929 A (TEVES GMBH ALFRED) 25. Juni 1998 (1998-06-25) Zusammenfassung; Ansprüche 1,5,9; Abbildungen	1
A	DE 198 22 478 A (NSK LTD) 3. Dezember 1998 (1998-12-03) Spalte 5, Zeile 60 -Spalte 6, Zeile 24; Abbildung 2	1

☐ Weitere Veröffentlichungen sind der Fortsetzung von Feld C zu entnehmen

☒ Siehe Anhang Patentfamilie

* Besondere Kategorien von angegebenen Veröffentlichungen :
"A" Veröffentlichung, die den allgemeinen Stand der Technik definiert, aber nicht als besonders bedeutsam anzusehen ist
"E" älteres Dokument, das jedoch erst am oder nach dem internationalen Anmeldedatum veröffentlicht worden ist
"L" Veröffentlichung, die geeignet ist, einen Prioritätsanspruch zweifelhaft erscheinen zu lassen, oder durch die das Veröffentlichungsdatum einer anderen im Recherchenbericht genannten Veröffentlichung belegt werden soll oder die aus einem anderen besonderen Grund angegeben ist (wie ausgeführt)
"O" Veröffentlichung, die sich auf eine mündliche Offenbarung, eine Benutzung, eine Ausstellung oder andere Maßnahmen bezieht
"P" Veröffentlichung, die vor dem internationalen Anmeldedatum, aber nach dem beanspruchten Prioritätsdatum veröffentlicht worden ist
"T" Spätere Veröffentlichung, die nach dem internationalen Anmeldedatum oder dem Prioritätsdatum veröffentlicht worden ist und mit der Anmeldung nicht kollidiert, sondern nur zum Verständnis des der Erfindung zugrundeliegenden Prinzips oder der ihr zugrundeliegenden Theorie angegeben ist
"X" Veröffentlichung von besonderer Bedeutung; die beanspruchte Erfindung kann allein aufgrund dieser Veröffentlichung nicht als neu oder auf erfinderischer Tätigkeit beruhend betrachtet werden
"Y" Veröffentlichung von besonderer Bedeutung; die beanspruchte Erfindung kann nicht als auf erfinderischer Tätigkeit beruhend betrachtet werden, wenn die Veröffentlichung mit einer oder mehreren anderen Veröffentlichungen dieser Kategorie in Verbindung gebracht wird und diese Verbindung für einen Fachmann naheliegend ist
"&" Veröffentlichung, die Mitglied derselben Patentfamilie ist

Datum des Abschlusses der internationalen Recherche	Absendedatum des internationalen Recherchenberichts
23. Oktober 2001	30/10/2001

Name und Postanschrift der Internationalen Recherchenbehörde	Bevollmächtigter Bediensteter
Europäisches Patentamt, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+31-70) 340-3016	Mende, H

Formblatt PCT/ISA/210 (Blatt 2) (Juli 1992)

INTERNATIONALER RECHERCHENBERICHT

Angaben zu Veröffentlichur die zur selben Patentfamilie gehören

...ter ales Aktenzeichen
PCT/EP 01/06398

Im Recherchenbericht angeführtes Patentdokument		Datum der Veröffentlichung	Mitglied(er) der Patentfamilie		Datum der Veröffentlichung
US 2703737	A	08-03-1955	KEINE		
GB 2086145	A	06-05-1982	DE	3132787 A1	13-05-1982
			FR	2489226 A1	05-03-1982
			US	4399380 A	16-08-1983
DE 19652929	A	25-06-1998	DE	19652929 A1	25-06-1998
			DE	59704401 D1	27-09-2001
			WO	9826963 A2	25-06-1998
			EP	0944506 A1	29-09-1999
DE 19822478	A	03-12-1998	JP	11043062 A	16-02-1999
			JP	11171027 A	29-06-1999
			DE	19822478 A1	03-12-1998
			GB	2327652 A ,B	03-02-1999
			US	6044723 A	04-04-2000